

Megapixel Longwave Infrared SLS FPAs for High Spatial Resolution Earth Observing Missions, Phase I

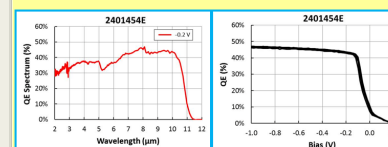
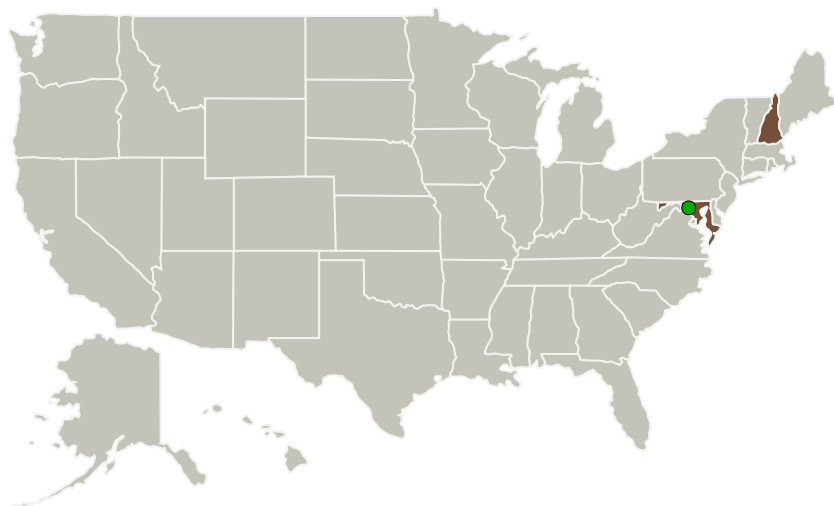
Completed Technology Project (2016 - 2016)



Project Introduction

Earth observing missions like NASA's LANDSAT Data Continuity Mission - Thermal Infrared Sensor (LDCM-TIRS) require greater spatial resolution of the earth than the $\sim 100\text{m}$ provided by the current instrument. Improving resolution to the desired $\sim 30\text{m}$ requires increasing the number of pixels on target from the current 640×3 to $\sim 2048 \times 3$. The TIRS instrument contains 640×512 longwave infrared quantum well infrared photodetector focal plane arrays (LWIR QWIP FPAs) jointly developed by NASA/GSFC and QmagiQ. We propose to achieve the higher pixel resolution while simultaneously improving quantum efficiency and operating temperature by using antimony-based strained layer superlattice (SLS) detectors. A key challenge is dealing with the effects of reducing pixel pitch from 25 microns down to ~ 10 microns, viz. optical fill-factor, optical crosstalk, processing difficulties, pixel operability, etc. As a stepping stone in Phase I, we propose to develop and deliver SLS FPAs with 1280×1024 format on 12 micron pitch that will address these challenges and quantify the effectiveness of our solutions. In Phase II, we will increase FPA format to 2048×2048 and push cutoff wavelength to the longest possible value while still hitting desired quantum efficiency and operating temperature targets in consultation with NASA/GSFC. Several FPAs will be delivered to NASA for evaluation.

Primary U.S. Work Locations and Key Partners



SPECTRAL QE OF RECENT QmagiQ ANTIMONY-BASED SLS MATERIAL

QE at 10 micron WAVELENGTH AS FUNCTION OF REVERSE BIAS

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Organizations Performing Work	Role	Type	Location
QmagiQ, LLC	Lead Organization	Industry	Nashua, New Hampshire
Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations	
Maryland	New Hampshire

Project Transitions

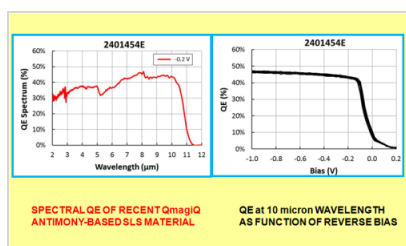
June 2016: Project Start

December 2016: Closed out

Closeout Documentation:

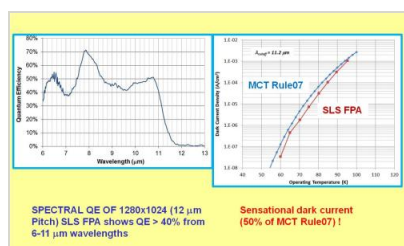
- Final Summary Chart(<https://techport.nasa.gov/file/139806>)

Images



Briefing Chart Image

Megapixel Longwave Infrared SLS FPAs for High Spatial Resolution Earth Observing Missions, Phase I (<https://techport.nasa.gov/image/130557>)



Final Summary Chart Image

Megapixel Longwave Infrared SLS FPAs for High Spatial Resolution Earth Observing Missions, Phase I Project Image (<https://techport.nasa.gov/image/132647>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

QmagiQ, LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

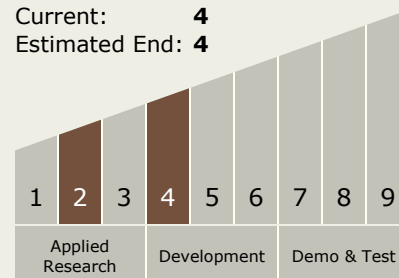
Carlos Torrez

Principal Investigator:

Mani Sundaram

Technology Maturity (TRL)

Start: 2
Current: 4
Estimated End: 4



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Technology Areas

Primary:

- TX08 Sensors and Instruments
 - └ TX08.3 In-Situ Instruments and Sensors
 - └ TX08.3.4 Environment Sensors

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System